MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2018/2019

EEL1166 – CIRCUIT THEORY

(All sections / Groups)

18 OCTOBER 2018
2.30 p.m. – 4.30 p.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **SIX** pages including cover page with **FOUR** questions only.

2. Answer **ALL** questions and print all your answers in the answer booklet provided.

3. All questions carry equal marks and the distribution of the marks for each question is given.

Question 1

(a) One of the commonly used circuit analysis methods is via Source Transformations. With the aids of diagrams, briefly explain how you apply the Source Transformation method in simplifying a circuit. [3 marks]

(b) Consider the circuit shown in **Figure Q1(b)**,

(i) By using Source Transformations and Kirchoff's Voltage Law, solve for the Thevenin equivalent circuit as seen by the 10Ω resistor (R_L) with the current of I_o flowing through it. [18 marks]

(ii) Does the circuit fulfill the requirement for the maximum power transfer? Justify your answer. [2 marks]

(iii) Determine the maximum power transferred to the R_L. [2 marks]

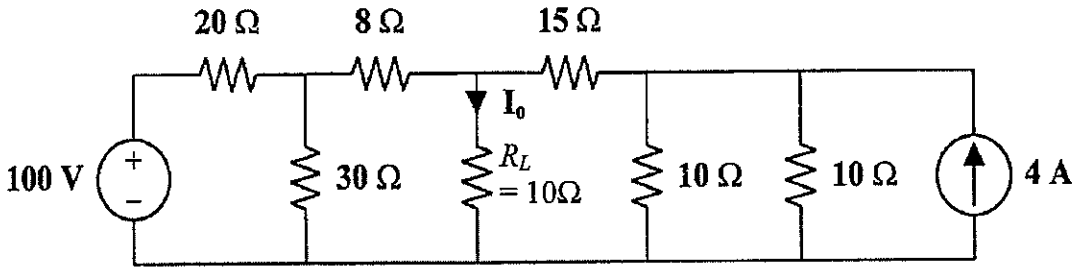

Figure Q1(b)

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Question 2

(a) For the circuit shown in **Figure Q2(a)**,

(i) What is the difference between loop and mesh? Determine the number of loops and meshes that can be formed in the circuit. [2+2 marks]

(ii) Using mesh analysis, solve the unknown currents i_1, i_2 and i_3. [8 marks]

(iii) Draw the topological graph of the circuit. [3 marks]

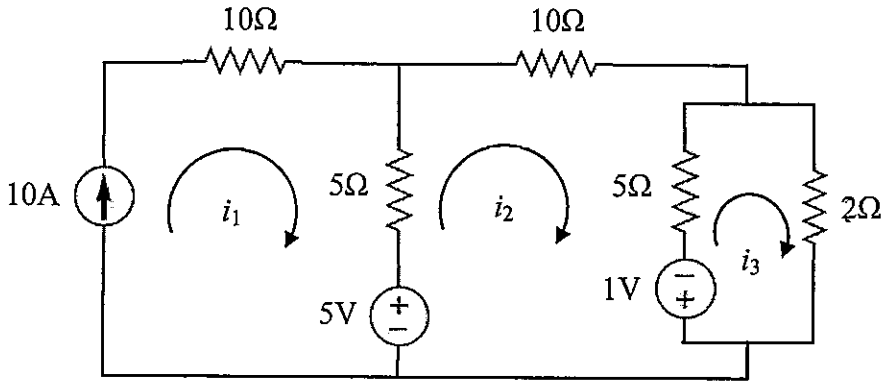


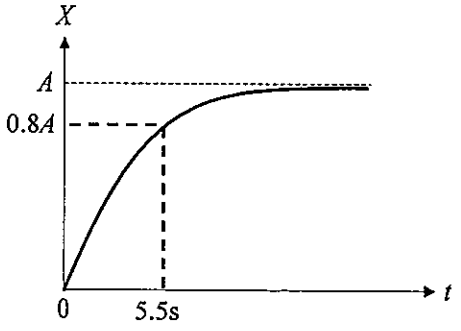
Figure Q2(a)

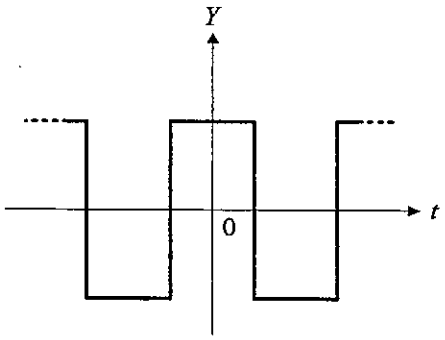
(b) Consider the signal waveforms shown in **Figure Q2(b)**,

(i) Define aperiodic signal. Which waveform is aperiodic signal? [3 marks]

(ii) Find the peak value, A and the time constant, τ of signal, $X(t)$. [2 marks]

(iii) Calculate the period, rms value and duty cycle of signal, $Y(t)$. [5 marks]





$$X(t) = 8 - 8\exp(-t/\tau)$$

$$Y(t) = \begin{cases} 5, & -2 \le t < 2 \\ -5, & 2 \le t < 6 \end{cases}$$

Figure Q2 (b)

Continued...

Question 3

(a) For the ac circuit shown in **Figure Q3(a)**, calculate the followings:

(i) Total impedance. [3 marks]

(ii) Total admittance. [3 marks]

(iii) Voltage, $v(t)$. [4 marks]

(iv) Power supplied to the circuit. [4 marks]

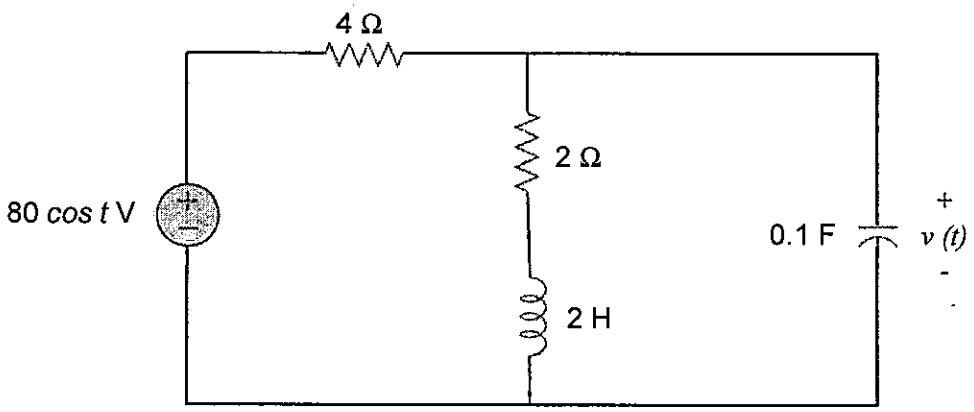


Figure Q3 (a)

(b) The resonant frequency in **Figure Q3(b)** is 10krad/s and the circuit quality factor is 5.

(i) Determine the circuit bandwidth. [2 marks]

(ii) Find the value of capacitor and inductor. [6 marks]

(iii) Calculate the suitable resistor value if the circuit is to be a *high*-Q circuit. [3 marks]

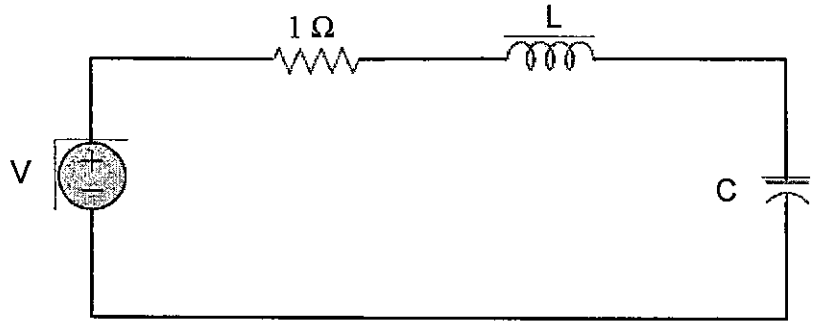


Figure Q3 (b)

Continued...

Question 4

(a) When does the transient behavior occur in an electric circuit? [3 marks]

(b) A RL transient circuit is shown in **Figure Q4(b)**. Given $R = 200\Omega$, $L = 500\text{mH}$ and $V_s = 10\text{V}$. Determine the following:

(i) The time constant (τ). [2 marks]

(ii) The final current (I_F) in circuit. [2 marks]

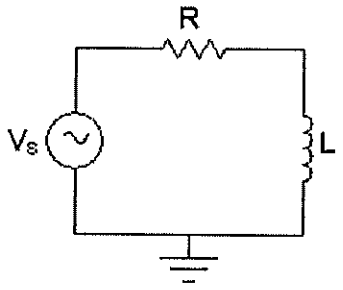


Figure Q4(b)

(c) A parallel RC circuit is shown in **Figure Q4(c)**. The switch is closed at circuit operating condition, and it opens at $t = 0$. Given $R_1 = 80\text{k}\Omega$, $R_2 = 10\text{k}\Omega$, $C = 120\mu\text{F}$ and supply voltage, $V_s = 200\text{V}$. Find the voltage, $v(t)$ for $t = 1$. [6 marks]

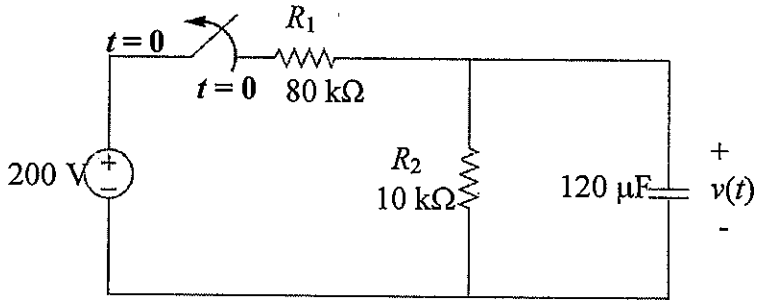


Figure Q4(c)

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(d) A parallel LCR circuit is shown in **Figure Q4(d)**. The impedance values, $R = 30\Omega$, $L = 20\text{mH}$ and $C = 3\mu\text{F}$ are all connected in parallel across a 50V, 100Hz supply. Calculate the following:

(i) Inductive reactance (X_L) and capacitive reactance (X_C). [4 marks]

(ii) Impedance. [3 marks]

(iii) Current of each branch. [3 marks]

(iv) Total current drawn from the supply. [2 marks]

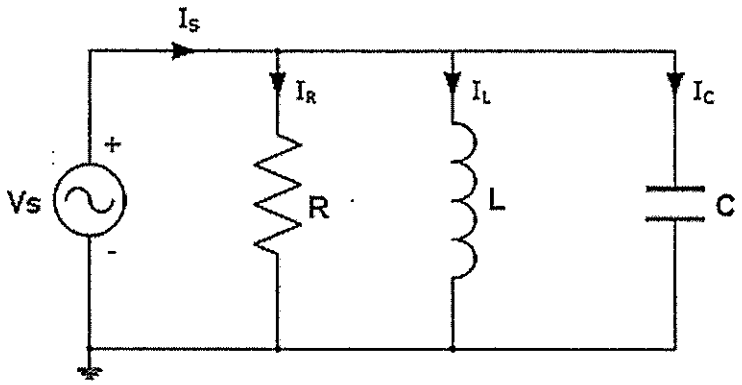

Figure Q4(d)

End of Paper